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Standard**

ISO 22371

**Security and resilience —
Community resilience — Principles,
framework and guidelines on urban
resilience**

**First edition
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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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This document was prepared by Technical Committee ISO/TC 292, *Security and resilience*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

Urban resilience is vital for protecting, sustaining and enhancing economic, social, physical, technical and environmental value. Resilience is defined as the ability to absorb and adapt in a changing environment. Urban resilience is the ability of any urban system, with its inhabitants, in a changing environment, to anticipate, prepare, respond to and absorb shocks, positively adapt and transform in the face of stress and uncertainty, while facilitating inclusive and sustainable development. This relies on the shared understanding and awareness of risks, ensuring prevention rather than cure and adopting a whole of society approach to resilience, where everyone plays their part.

Urban resilience includes the resilience of:

- a) People and communities
- b) Governance and public services
- c) Trade and business services
- d) Environment, infrastructure and resources

In an increasingly complex and changing world, urban areas are becoming ever more dynamic and influential. Concurrently, as urban environments evolve and grow in complexity, so do the risks and challenges they face, such as those due to climate change, increased reliance on technology and global supply chains.

Urban areas that are more resilient can better realize their strategic ambitions, protect their critical resources, capitalize on investment, create and sustain opportunities for enterprise, and empower individuals, communities, institutions and businesses to not only survive, but to adapt and prosper.

With 68 % of the global population set to be urban dwelling by 2050,^[1] urban resilience is becoming ever more essential in meeting the increasing social, economic and environmental challenges that come with this level of growth.

In order to meet Goal 11 of the United Nations Sustainable Development Goals^[1] – to make cities inclusive, safe, resilient and sustainable – urban areas should adopt strategies that:

- take a proactive and integrated approach to resilience;
- transcend departmental and organizational boundaries; and
- are grounded in a comprehensive understanding of the challenges facing the urban environment.

Urban resilience requires an integrated, system-based approach, drawing on the knowledge contained across a broad range of disciplines. This approach facilitates shared understanding and learning for adapting in complex and dynamic environments, promoting a collective and inclusive approach to change.

Urban resilience is a collective responsibility and is enhanced when the whole of society is enabled and empowered to act and engage in support of those in a decision-making capacity, such as local government and communities.

This document has been developed in response to increasing global demand for guidance on the development and implementation of strategies which seek to improve urban resilience in the face of the social, environmental, technical and economic challenges the world faces, now and in the future.

Security and resilience — Community resilience — Principles, framework and guidelines on urban resilience

1 Scope

This document provides principles, framework and guidelines on how to enhance urban resilience to protect communities, people and organizations and improve residents' quality of life. It describes:

- a) how to build capacity to better manage change and disruptive events, minimizing the impacts on the residents, including the most disadvantaged and vulnerable persons;
- b) the benefits of urban resilience;
- c) how to organize, assess, plan, implement and continually improve urban resilience.

This document is applicable to all urban contexts, governance structures and stakeholders for all identified levels of risk. It is intended to be used by all organizations that have accountability for resilience of services in urban communities.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 22300, *Security and resilience — Vocabulary*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 22300 and the following apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

3.1

capacity

combination of all the strengths, capabilities and resources available within an organization, community or society that can reduce the level of risk or the effects of a crisis and that has the ability to deal with uncertainty and adapt to change

Note 1 to entry: Capacity can include physical, institutional, social, technical or economic means as well as skilled personnel or attributes such as leadership and management.

[SOURCE: ISO 22300:2021, 3.1.25, modified — added “capabilities” and “and that has the ability to deal with uncertainty and adapt to change” to the definition.]

3.2

resilience

ability to absorb and adapt in a changing environment

Note 1 to entry: Urban resilience is the ability of any urban system, with its inhabitants, in a changing environment, to anticipate, prepare, respond to and absorb shocks, positively adapt and transform in the face of stress and uncertainty, while facilitating inclusive and sustainable development.

[SOURCE: ISO 22300:2021, 3.1.206, modified — the note 1 to entry has been modified to reflect the scope of this document.]

3.3

shock

abrupt or acute event that has the potential to impact upon the purpose or objectives of an urban system

Note 1 to entry: [Table 2](#) addresses the evaluation of shocks, stresses and trends.

[SOURCE: ISO 22300:2021, 3.1.263, modified — “uncertain” deleted; “long onset” changed to “acute”; note 1 to entry has been added.]

3.4

stakeholder

interested party

person or organization that can affect, be affected by, or perceives itself to be affected by a decision or activity

[SOURCE: ISO 31073:2022, 3.3.2]

3.5

stress

chronic and ongoing dynamic pressure with the potential for cumulative impacts on the ability and capacity of the system to achieve its objectives

Note 1 to entry: [Table 2](#) addresses the evaluation of shocks, stresses and trends.

[SOURCE: ISO 22300:2021, 3.1.269, modified — “originated within an urban system” deleted; note 1 to entry has been added.]

3.6

urban area

geographic area containing a populated, built environment

Note 1 to entry: Urban areas usually include cities or towns and their outlying suburbs.

3.7

urban resilience

ability of any urban system, with its inhabitants, in a changing environment, to anticipate, prepare, respond to and absorb shocks, positively adapt and transform in the face of stress and uncertainty, while facilitating inclusive and sustainable development

Note 1 to entry: A more resilient urban system is characterized by its ability to continue providing services through disruption in the short- to medium-term, combined with a capacity to reduce pressures and adapt to changes, risks and opportunities. Urban resilience, therefore, is dependent upon the ability of urban systems not just to deal with shocks, but also with chronic stresses, uncertainties and change.

Note 2 to entry: Urban resilience is dependent upon the individual and collective resilience of the separate components of a complex urban system. Although a city, town or community within an urban area can individually demonstrate enhanced resilience within its respective boundaries, urban resilience encompasses the broader geographic scope of urban agglomeration. Resilience of an urban system is measured by the capacity for resilience of each individual system component and dependent upon the resilience of the weakest performer among the urban agglomeration within the system scope.

Note 3 to entry: In order to assess, plan and act accordingly in the face of shocks, stresses and uncertainty, an urban system's resilience capacity should be measured and analysed through qualitative and quantitative data.

[SOURCE: ISO 22300:2021, 3.1.284, modified — notes 1 to 3 to entry have been modified]

3.8

urban system

human settlement, integrated and complex set of system components, characterized by physical, functional, organizational and spatial dimensions; comprised of people, processes and assets managed through effective governance mechanisms in order to deliver the urban societal objectives

Note 1 to entry: Being dynamic, the composition and elements of an urban system changes with time.

Note 2 to entry: Every urban area has characteristics of an urban system, regardless of its size, culture, location, economy and/or political environment.

Note 3 to entry: Characterized as urban systems, urban areas have the objectives of managing the complex interactions and interdependencies among its multiple components, with the purpose of fulfilling a variety of functionalities including social, economic, technical, cultural and environmental.

[SOURCE: ISO 22300:2021, 3.1.285, modified — deleted “universal and interdependent”; “in order to deliver the urban societal objectives” has been added to the definition]

3.9

vulnerable group

individuals who share one or several characteristics that are the basis of discrimination or adverse social, economic, cultural, political or health circumstances and that cause them to lack the means to achieve their rights or, otherwise, enjoy equal opportunities

[SOURCE: ISO 22300:2021, 3.1.292]

3.10

vulnerable person

individual who is less able to anticipate, prepare, respond to and absorb shocks, or positively adapt and transform in the face of stress and uncertainty

Note 1 to entry: In this document, a vulnerable person is not defined by the nature of the vulnerability but by their personal circumstances.

[SOURCE: ISO 22300:2021, 3.1.293, modified — definition and note 1 have been modified]

4 Principles for urban resilience

In order to improve urban resilience, the responsible body and stakeholders should be guided by the principles listed in [Table 1](#) that underpin resilient urban systems. The responsible body is the council, governing body, board or the person or body with ultimate decision-making authority in regard to urban resilience. They should be at the core of all resilience behaviours, strategies and outcomes.

Table 1 — Principles

Principles	Description
Accountable	Upholding methods for effective governance that promote clear responsibilities, accountability, unity of vision and transparency; delivering long-lasting urban resilience benefits that go beyond short-term decision-making cycles (for example, electoral cycles, annual budgets, short-term investment plans and programmes) and avoid fragmentation, ensuring that there are long-term, sustained financing mechanisms in place to provide ongoing support to urban resilience-building projects.
Adaptive	Building flexibility and resourcefulness; creating urban systems that can evolve and manoeuvre quickly in a changing landscape – addressing risks and capitalizing on opportunities. Accepting of ever-increasing uncertainty and change and having the ability to apply existing resources to new purposes. Rapidly finding different ways to achieve desired outcomes or meet needs during a shock or when under stress, mobilising human, financial, technical and material resources inside or outside of traditional response structures to deliver innovative solutions in the face of adversity.
Aware	Gathering information, harnessing real-time data and conducting horizon scanning to improve awareness, anticipate change and inform evidence-based decision-making. Assessing, building knowledge capital, learning and continually improving for better future outcomes.
Inclusive	Conducting broad consultation and co-creating with communities, including those which are identified as vulnerable – creating community cohesion, strengthening social contracts and empowering people to participate and create a whole society approach to resilience. All parts of the community agree on a vision for its future and are aware of the shocks and stresses it faces and their respective and complementary roles in protecting and strengthening urban resilience. Benefits and impacts are distributed justly and equitably across urban networks; reducing social stresses and disproportionately poor outcomes for vulnerable groups.
Integrated	Integrating and aligning urban systems to reduce silos and bring together decision makers, sectors, departments, budgets, activities, and agendas. Maintaining a systems-thinking approach, looking at the whole system rather than focusing on its individual parts to better understand the complexity and interdependencies between multiple stakeholders with divergent perspectives, allowing for solutions that provide multiple benefits and prevent cascading and disproportionate failures across the system.
Prepared	Addressing identified system vulnerabilities through robust design, redundancy, spare capacity and fail-safe measures, balancing risk, performance and cost. Responding quickly to mitigate adverse impacts of events and to accelerate recovery.
Sustainable	Pursuing and committing to sustainable, resource efficient solutions for long-term, whole system urban resilience that do not compromise the well-being and quality of life for future generations and ecosystems – building on the recommendations of the United Nations Sustainable Development Goals.
Transformative	Bouncing forward following disasters so that systems can thrive, not just survive. Rapidly finding different ways to achieve their goals or meet their needs under changing circumstances. Transcending traditional ideas, roles, and patterns to create something new by using originality of thought and demonstrating imagination.

5 Framework for delivering urban resilience

This framework provides the foundation for successful urban resilience, and is iterative and continuous. Urban areas will be at various stages of maturity and development with regard to the steps laid out in this section. Existing local and international initiatives should be aligned with and integrated into the urban resilience strategy. The framework's five key steps are set out in the following clauses:

- Organize and define: Establishing governance structures, engaging key stakeholders, developing a shared vision, objectives and goals and data collection for managing urban resilience ([Clause 6](#)).
- Assess and prioritize: Performing a systems-based urban resilience assessment and prioritizing urban resilience needs ([Clause 7](#)).
- Strategy development: Developing ([Clause 8](#)) and maintaining a prioritized schedule of urban resilience initiatives needed to achieve goals and objectives.

- d) Implementation: Developing detailed resilience projects, and managing their delivery ([Clause 9](#)).
- e) Continual improvement: Monitoring, measuring, analysing, adjusting, learning and innovating continuously ([Clause 10](#)).

The responsible body should:

- follow the framework described in the five steps above [a) to e)], along with the activities described in [Figure 1](#) under each step when developing strategies for and delivering urban resilience;
- consider the principles specified in [Table 1](#) in every step of the process.

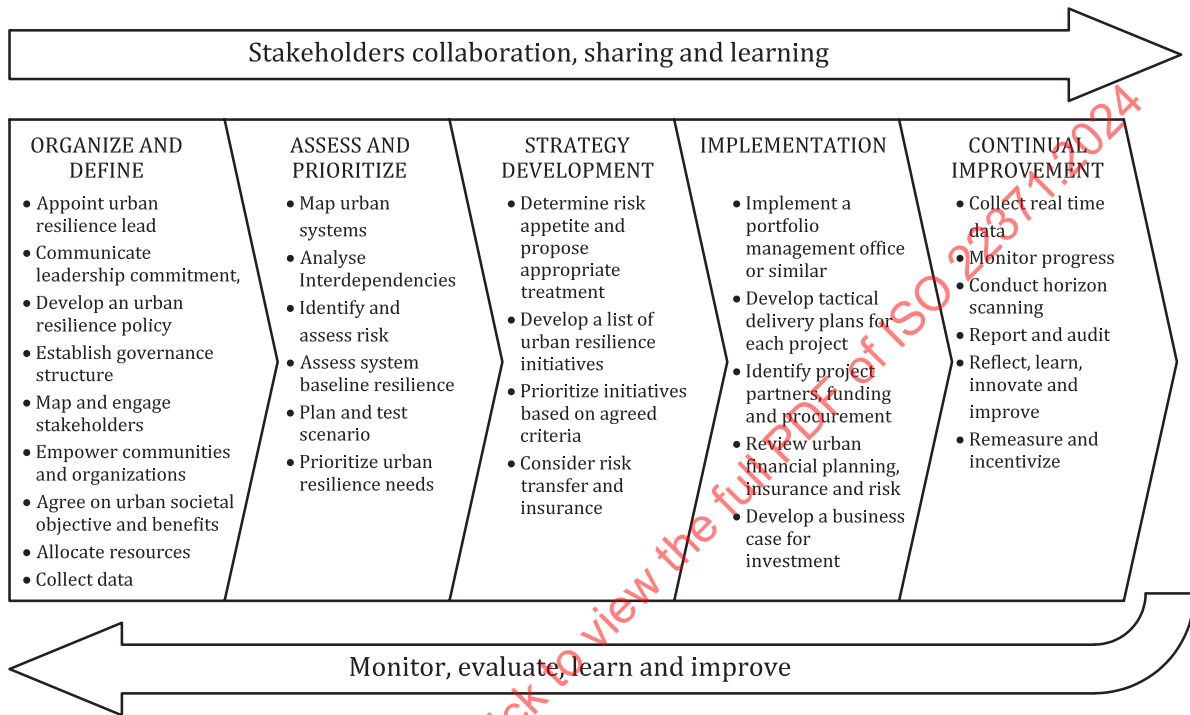


Figure 1 — Framework for urban resilience showing steps and associated activities

[Annex A](#) provides a checklist of the expected activities for developing and implementing the urban resilience strategy, which sit within the framework given in [Figure 1](#).

6 Organize and define

6.1 Governance, leadership and commitment

6.1.1 General

To enable responsible authorities to support the enhancement of urban resilience, adequate governance arrangements should be established to build an environment of trust, transparency and accountability to deliver the activities outlined in the urban resilience policy and strategy.

Entities may use existing governance frameworks or apply the governance structure outlined in this document.

6.1.2 Leadership

To enhance urban resilience capacity, a mandate or “authority to act” should be provided by the responsible body (see [6.1.5.2](#)) which has the authority to appoint an urban resilience lead. A clear definition for this role

should be created reflecting the appropriate qualifications, life experiences and capabilities to ensure an appropriately competent person is selected to hold this position.

To demonstrate the importance of this role, this appointment should be formally recognized through a public announcement, launch event and strategic social media campaign to spread the message across the community.

6.1.3 Commitment

The responsible body should:

- a) demonstrate a strong and sustained commitment to urban resilience;
- b) appoint and support the urban resilience lead;
- c) mobilize the support of all other responsible parties who take on formal roles and responsibilities within the strategy and implementation team.

6.1.4 Urban resilience policy

The responsible body should:

- a) develop an urban resilience policy that sets out the rules of engagement, expectations, and governance structure for the urban resilience process;
- b) use the policy as a central resource and agreed code of conduct to guide the organizations and individuals who engage in urban resilience.

6.1.5 Governance structure

6.1.5.1 General

[Figure 2](#) provides a model governance structure for delivering urban resilience; it can vary depending on the size and resources of the urban area.

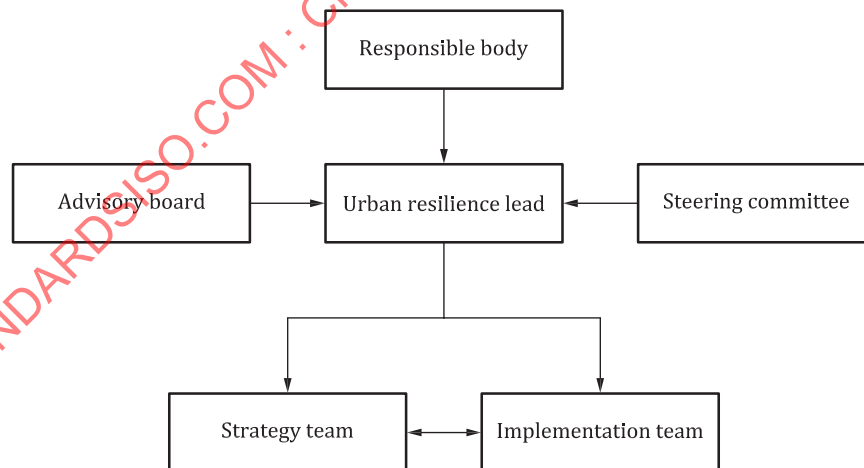


Figure 2 — Model governance structure

NOTE ISO 37000 gives guidance for the effective delivery of governance of organizations.

6.1.5.2 Responsible body

The responsible body (the council, governing body, board, or the person or body with ultimate decision-making authority in regard to urban resilience) should:

- a) develop, adopt and perform the champion role for the development and implementation of the urban resilience policy and strategy;
- b) remove barriers and facilitate the implementation of the urban resilience strategy;
- c) provide regular updates, both formal and informal, across various media channels to encourage the development of an overall urban resilience culture.

6.1.5.3 Steering committee

The steering committee (a cross-sectoral stakeholder group that participates in the development and delivery of the urban resilience strategy) should:

- a) be diverse and represent all significant aspects of the community it serves through a balanced and appropriate representation from the community;
- b) have the appropriate experience, skills and knowledge to give the programme the effective direction it requires;
- c) employ effective governance practices.

6.1.5.4 Urban resilience lead

The urban resilience lead (programme leader and facilitator who acts on behalf of the responsible body in respect to all aspects of the urban resilience strategy and its implementation) should:

- a) report to the responsible body (6.1.5.2) and the steering committee (6.1.5.3);
- b) propose an urban resilience strategy developed through a process involving official members of the programme team, key organizations and stakeholders from across the urban community;
- c) propose a plan of action to seek the agreement of a diverse representation of the urban community for successful programme and project delivery;
- d) establish key performance targets and indicators (KPIs) and regularly assess and report the performance of the urban resilience programme against expectations, objectives and agreed milestones while responding to changing risks and requirements;
- e) act as the conduit and engage all formal team members to provide regular feedback to adapt, improve and continue positively supporting the strategy;
- f) prepare and manage a central remedial action register to guide the performance improvement process as the programme progresses from the formal start to conclusion.

6.1.5.5 Advisory board

The urban resilience lead should:

- a) assemble an advisory board of subject matter experts responsible for providing governance and scrutiny of the strategy and its implementation;
- b) consider including representatives from other urban areas that have implemented urban resilience programmes.

6.1.5.6 Strategy team

The urban resilience lead should assemble a strategy team to manage, develop and lead the development of the urban resilience strategy.

The strategy team should:

- a) be accountable for developing and leading the strategy;
- b) assemble an inclusive steering committee (see [6.1.5.3](#)) to participate in the development and implementation of the urban resilience strategy;
- c) create an advisory board to support the development and implementation of the urban resilience strategy (see [6.1.5.5](#));
- d) assemble an implementation team (see [6.1.5.7](#)) to deliver the suite of urban resilience projects and programmes.

6.1.5.7 Implementation team

The implementation team is responsible for delivering the urban resilience strategy. It should be structured to support moving programmes and projects through the stages of implementation. Implementation can be achieved through existing networks and structures if they have sufficient resources, support and accountability.

6.2 Vision, objectives and benefits of the urban resilience strategy

6.2.1 Vision and objectives

The urban resilience lead, strategy team and steering committee should:

- a) engage the community to determine a shared vision and objectives which are important to the urban area;
- b) identify the shared and individual benefits to foster alignment and engagement between stakeholders;
- c) develop measures for monitoring and evaluating the benefits and outcomes of the urban resilience strategy.

The urban resilience strategy is intended to protect the systems that deliver benefits to the residents of the urban area and seek opportunities to increase these benefits within a changing context. A broad scope should be defined encompassing social, economic, environmental, governance, technical and physical systems, and maximizing the beneficiaries of the programme, particularly underrepresented and vulnerable groups. [Figure 3](#) provides examples of urban societal objectives.



Figure 3 — Example of urban societal objectives

6.2.2 Articulating benefits

The urban resilience lead should clearly articulate the benefits that the urban resilience strategy will deliver and whom it would benefit, focusing on those areas and communities most in need. Benefits can include:

- a) stronger evidence backing investment decisions and better return on investments by providing a holistic understanding of cost/risk benefit of urban resilience initiatives;
- b) improved urban economic performance through increased productivity, reduced down time and losses following a disruption;
- c) increased public participation in planning for urban resilience at the household, community and local government levels;
- d) improved transparency and accountability of responsible body in charge of planning, implementing, monitoring and analysing the urban resilience strategy;
- e) increased social trust and confidence amongst urban area stakeholders;
- f) improved awareness and understanding of the urban area's strengths, weaknesses opportunities and threats;
- g) shared commitments and performance metrics that are actively monitored, to demonstrate progress;
- h) improved community cohesion and urban support networks; sharing resources across households, communities, organizations, and networks;
- i) a culture of resilience at all levels of the urban system, through increased awareness, effective planning, public engagement and improved ownership of resilience;
- j) increased connection to place, sense of belonging and community pride;
- k) improved living standards and meeting of basic needs of urban area residents;
- l) improved well-being and quality of life.

The urban resilience lead should articulate the types and consequences of risks in the urban area and their potential impacts on inhabitants, assets and processes in the absence of an urban resilience strategy.

6.3 Communication and engagement

6.3.1 General

Inclusive community engagement helps to provide for a comprehensive community assessment, more effective awareness of urban resilience strategies, better prioritization of resources and opportunities to build advocates and champions.

The responsible body should develop an engagement plan using existing stakeholder forums or structures, tailoring or modifying them to include a focus on urban resilience.

The engagement plan should include:

- a) objectives for the engagement and level of engagement required;
- b) identification, mapping and analysis of stakeholders (see [6.3.3](#));
- c) methods of engagement;
- d) communication plan for exchanging information and raising awareness of the strategy;
- e) key messages for communicating with each stakeholder group and their intermediaries;
- f) opportunities for participation in community events to raise awareness;
- g) social or digital media tools and activities;
- h) cultural and language considerations to reflect community diversity.

An engagement plan can be made available in both a detailed version and a condensed version for the benefit of the public and non-specialists.

The urban resilience lead should:

- facilitate inclusive community engagement throughout the development and implementation of the urban resilience strategy to effectively increase involvement, impact, trust and communication;
- seek to ensure broad community engagement, including people from all neighbourhoods, age groups, communities, institutions, businesses;
- identify and focus on groups that have been traditionally under-represented in decision-making and those in vulnerable situations;
- advance engagement by aligning with the local context and respecting long-standing cultural traditions, including those of indigenous peoples (see [8.1](#) and [9.3](#)).

NOTE 1 For guidance on identifying, engaging and responding to the needs of vulnerable persons during emergencies, see ISO 22395.

NOTE 2 There are many different models, frameworks, and concepts that provide detailed guidance on community engagement. For example, the IAP2 Spectrum of Public Participation.^[5]

NOTE 3 Legal requirements on issues related to land use and services provided by the local government can apply.

6.3.2 Identification, mapping and analysis of stakeholders

Many stakeholders have an interest in and responsibility for urban resilience. In developing the engagement plan, the responsible body should identify, map and analyse potential stakeholders from all areas of the community and themes of interest reflecting local circumstances.

The responsible body should take into consideration the relevance of various stakeholders in terms of their power (political, legal, social capital); capacity (knowledge, expertise); and interest (whether the success or failure of an intervention has a strong impact on a particular stakeholder).

The list of identified stakeholders should include representatives from:

- a) emergency services, utility and transport providers;
- b) civic elected bodies;
- c) government agencies (e.g. departments of local government, health and education);
- d) financial and other business sectors;
- e) voluntary sector;
- f) faith-based and community organizations;
- g) indigenous communities;
- h) vulnerable groups, relevant associations, and forums;
- i) academia;
- j) organizations with subject matter experts, where relevant.

NOTE Many informal systems exist in an urban area that are difficult to detect and describe but do have an impact on urban resilience. Identifying, mapping and analysing the relationships between decision-makers of different agencies and groups of people sharing common characteristics is beneficial for identifying these relationships and the development of the urban resilience strategy.

The strategy team should categorize those individuals and organizations who can:

- be most affected by the urban resilience initiatives developed, or supported by other groups;
- develop urban resilience initiatives at the community level, urban area and/or policy level;
- support urban resilience initiatives at different levels (e.g. neighbourhood, city);
- contribute useful information and strategic advice or serve as advocates for the urban resilience strategy;
- be potential partners in the implementation of the urban resilience strategy (see [9.3.5](#)).

The final list of stakeholders should be revised as and when necessary, as the strategy development and implementation proceeds.

6.3.3 Communication and outreach

The responsible body should involve the relevant stakeholders needed to build urban resilience through effective communication and outreach by:

- a) recognizing that urban resilience can be a new concept for some individuals and organizations;
- b) raising awareness about the rationale for developing an urban resilience strategy and what the responsible body hopes to achieve by undertaking this work;
- c) determining the outreach process to undertake and develop a communication and engagement plan;
- d) focusing the communication activities initially on public and stakeholder education about urban resilience and the shocks, stresses, trends and opportunities facing the urban area;
- e) monitoring and measuring effectiveness of communication activities; and
- f) updating this plan throughout the development and implementation of the strategy.

6.3.4 Strategies for effective community engagement

The responsible body should create a culture that encourages involvement of stakeholders by:

- a) determining leadership commitment and objectives before designing methods;
- b) managing expectations of stakeholders through establishing the clear role of those involved in the engagement;
- c) inviting the community to help design the engagement process;
- d) sharing all relevant information, informing stakeholders about decisions already agreed upon and focusing on areas open for input;
- e) setting clear measurement goals for the engagement plan and if possible, developing these in collaboration with community representatives;
- f) determining budget and resources that provide sufficient time for an adaptive engagement process and engagement activities that match the level of engagement with the complexity of problem or issue;
- g) building relationships with stakeholders and addressing privacy and security concerns for collection and use of personal data prior to the engagement process;
- h) providing support for the involvement of identified stakeholders (e.g. providing childcare or transportation, holding events during evenings or weekends, or providing compensation for community members and stakeholders who are not already being compensated as part of their paid work to participate in the process);
- i) creating opportunities for people to be heard by partnering with allies or using a relationship broker or intermediary for hard-to-reach groups.

Social media can facilitate community engagement and encourage diverse views, however, it can also be a source of disinformation and negative information that should be closely managed.

6.4 Allocation of resources

The responsible body should:

- a) estimate the type and amount of resources required for planning, implementing and monitoring the urban resilience strategy;
- b) identify current and future available resources, highlighting and addressing gaps in resource availability;
- c) determine relevant stakeholders across public and private sector including international donors.

Resources include, but are not limited to:

- financial resources including local and relevant regional/central government budgets, funds and financial incentives (see [Annex B](#)), partnerships including public, private partnerships (PPP);
- human resources including technical expertise and volunteers for data collection, managing data processing, analysis, diagnosis, support the development of recommendations, etc.;
- technical resources including data, information and knowledge;
- material resources including natural areas and assets, infrastructure and facilities.

6.5 Data collection, assessment and sharing

The responsible body should:

- a) determine the type of knowledge it seeks to generate, supported by a rationale that is grounded in recognized urban resilience good practices, taking into account the priority goals to be achieved by the strategy;
- b) determine the type of information and knowledge required for carrying out the analysis;
- c) develop methods and tools for data collection and allocate relevant resources and infrastructure;
- d) provide a secure information exchange protocol to facilitate data sharing between relevant stakeholders;
- e) set criteria for assessing the data, including their relevance and reliability, storage, sharing, protecting, and processing of different formats including graphics, statistics, and geo-spatial information;
- f) collect robust data for the purpose of conducting a comprehensive evidence-based analysis and assessment of the urban area's capacities, strengths and weaknesses in the face of different risks;
- g) use multiple sources of qualitative (including local and traditional knowledge) and quantitative data gathered using different modalities and techniques;
- h) develop a mechanism for assessing data collection completion according to the identified thresholds, metrics and indicators.

The responsible body should consider, in the absence of quantitative evidence, the perceived strengths and weaknesses of those impacted and those responsible for aspects of the system, and assess the quality and completeness of qualitative data to inform the reliability of the conclusions drawn.

The urban resilience lead should document where there is neither quantitative nor qualitative data available to assess the urban area's capacities, strengths and weaknesses in order to account for "known unknowns" into decision-making and to implement a plan for the future collection of data to fill the gaps.

NOTE 1 ISO 22396 gives guidelines for information exchange between organizations.

NOTE 2 ISO/IEC 27001 specifies the requirements for establishing, implementing, maintaining and continually improving an information security management system within an organizational context.

7 Assess and prioritize

7.1 General

The strategy team should conduct an analysis of the urban systems, using qualitative or quantitative data, or both, as appropriate. The analysis should include:

- a) a focus on delivering the vision and objectives determined in [6.2.1](#), linking the risk to the goals developed and the prioritization of urban resilience initiatives;
- b) mapping the systems of the selected urban area to assess interdependencies considering the criticality of the elements in the systems to services delivered to the residents and organizations;
- c) gathering information to understand the urban context and current risks, opportunities and current level of resilience;
- d) analysis of shocks, stresses, trends and opportunities including emerging trends and future risks and cascading implications across the urban resilience system;
- e) an evidence-based assessment of the urban area systems' strengths, weaknesses, opportunities and threats related to its resilience, using performance indicators based on objective and verifiable data, either quantitative or qualitative, or both, as appropriate.

These points are covered in more detail in [7.2](#) to [7.7](#).

7.2 System value and benefits

The strategy team and steering committee should ensure that the urban resilience strategy is driven by an evidence and risk-based assessment that quantifies the potential impact of shocks and stresses on the delivery of the vision and urban societal objectives. The urban resilience strategy should deliver benefits that consider not just “return on investment” but broader urban societal outcomes and aspects of urban resilience such as well-being, ecosystems and the ability of future generations to meet their needs.

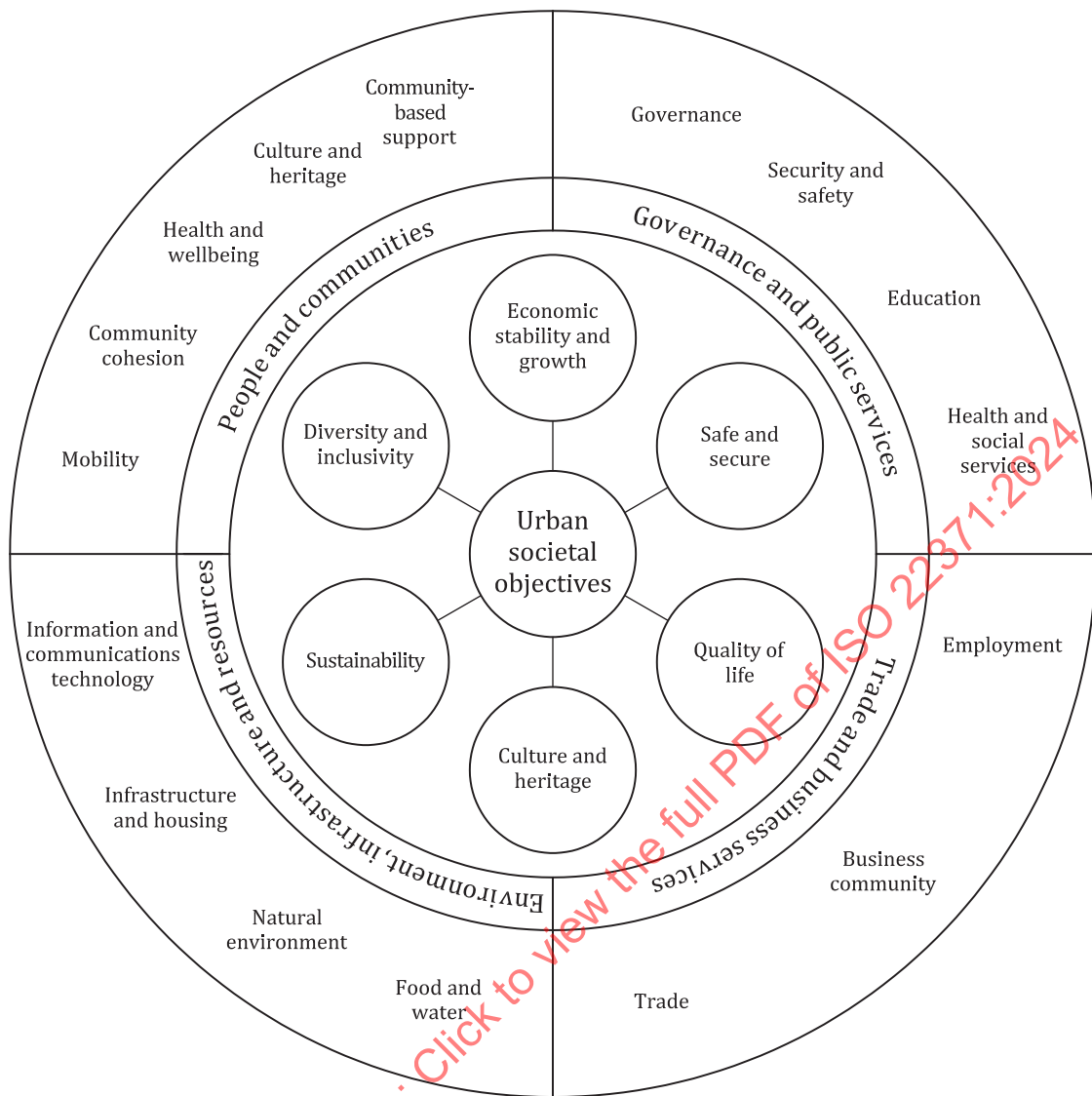
7.3 System definition and understanding

7.3.1 System mapping

The urban area is a system within a set of systems, which have interconnected functions that sustain the purpose and outcomes of the urban area. Interdependencies within and at the boundary of the urban area should be understood and form part of the urban resilience assessment.

The urban resilience lead and steering committee should, at the start of the assessment:

- a) define the urban area based on geographical, city or population boundaries that already exist;
- b) identify and map the systems that deliver value within the urban area [infrastructure, environment and resources; people and communities; local government and businesses (see [Figure 4](#))];
- c) pay particular attention to more vulnerable populations and communities where the impact of risk can be more acutely felt.



SOURCE: BS 67000:2019^[8], reproduced with the permission of the authors.

Figure 4 — Example urban objectives and value systems

These systems can be mapped in a geospatial information system so that exposure can be overlaid against specific shock and stress factors.

7.3.2 Interdependencies and critical components

The strategy team should:

- identify critical functions and components (as defined by the responsible body and relevant to urban resilience);
- evaluate the importance of systems based on their contribution to overall urban societal value delivery (i.e. meeting the needs and objectives of the urban area);
- account for the interdependencies within the urban area where the majority of urban area functions would cease to operate in the event of interruptions to, or failures of, the system, elevating the importance of this part of the system (e.g. electrical distribution system, telecommunications system);
- focus on functions and components of critical importance in the urban resilience assessment;

- e) promote cooperation, especially in shared processes (i.e. required roles and people, action sequences, prerequisites, rules), to improve understanding of interdependencies and critical components in the urban area on a socio-technical level;
- f) communicate system interdependencies and criticalities to stakeholders.

7.4 Risk identification and assessment

As part of the urban resilience assessment, the strategy team should:

- a) engage local communities and experts to identify key shocks, stresses, trends and opportunities, in order to understand potential threats to the achievement of the urban societal objectives; these should be reviewed against the local and national risk registers;
- b) consider new and emerging stresses, shocks and opportunities that have not been experienced before;
- c) capture and collate data sets to provide an in-depth understanding in terms of hazard analysis and modelling, and exposure mapping;
- d) identify historical hazard losses and future trends and their interrelationships with other shocks and stresses;
- e) consider unpredictable or unforeseen “black swan” events, typically those with extreme consequences.

NOTE 1 ISO 14091 provides guidance on adaptation to the climate change risks.

NOTE 2 ISO 22361 provides guidance on strategic crisis management capability, which can be applied to managing “black swan” events.

[Table 2](#) provides an overview of this process including data collection advice and outputs/outcomes of the assessment.

Table 2 — Evaluation of shocks, stresses and trends

	Sources of information and knowledge needed for the assessment	Expected outcomes of the assessment
Shocks	1. Accumulated local knowledge and experience. 2. Extensive research and relevant studies carried out by local authorities, experts in the field, universities and research centres, among others. 3. Assessment of the shocks (current and emerging) impacting the urban area. 4. Outcomes of the quantitative and qualitative assessment of urban system performance to highlight gaps, weaknesses and vulnerabilities. 5. Incident reports from responsible bodies such as emergency services or public works 6. Local risk registers.	1. Understand the causes, frequency and intensity of each shock identified on people, assets and processes. 2. Articulate the links between the identified shocks and elements of urban systems.
Stresses	1. Accumulated local knowledge and experience 2. Assessment of the stresses (current and future) impacting the urban area 3. Outcomes of the quantitative and qualitative assessment of urban system performance to highlight gaps, weaknesses and vulnerabilities. 4. Emerging evidence of change that can impact the urban area.	1. Identify the top stresses impacting the urban area. 2. Understand the seriousness and severity of the pressure applied on the urban system by the identified stresses. 3. Map the direct and indirect links between the stresses identified and the different elements and components comprising the urban system. 4. Deduce how impacts of stresses increase the system's vulnerability to the identified shocks, and vice versa.
Trends	1. Accumulated local knowledge and experience. 2. Academic literature and research. 3. Climate change model outputs. 4. Experience reports from other regions.	1. Utilize horizon scanning to identify relevant trends. 2. Infer the potential of the identified trends to exacerbate the impacts of both identified shocks and stresses. 3. Evaluate the opportunity that these trends can bring to the urban area.

NOTE ISO 31000 provides guidance on managing risk, setting and achieving objectives and improving performance.

7.5 System baseline urban resilience assessment

7.5.1 System risk

The strategy team should:

- a) evaluate the risk to systems' critical components from the identified shocks, stresses and trends;

- b) consider whether the component under consideration is exposed to this risk and the level of risk;
- c) take into account changes in risk over time to understand longer-term urban resilience;
- d) factor into the urban resilience assessment the effects of trends or stresses, such as climate change or population/demographics;
- e) consider emerging risks in the assessment;
- f) identify whether the shocks, stresses and trends provide an opportunity as well as a threat.

7.5.2 System capacity

The strategy team, with support from the steering committee should determine as part of the urban resilience assessment, the current measures available in the urban systems to mitigate and adapt to the impact of shocks and stresses and reduce the overall system risk. This system capacity includes robustness measures for increasing system strength and redundancy measures to backup critical systems, response and recovery plans to reduce the impact of a disaster and flexibility to adapt to changing conditions.

7.5.3 Gap analysis

The urban resilience assessment should be linked to the urban societal objectives to identify the “value at risk” for each critical component. This provides a baseline of urban resilience under current conditions, aids the prioritization of urban resilience initiatives, and establishes a benchmark to measure progress and develop future scenarios.

The strategy team should:

- a) evaluate the “urban resilience gap” between system risk and system capacity as an indicator for areas requiring urban resilience building and of the residual risk within the critical urban systems; or
- b) use an indicator-based approach to help identify these areas.

NOTE There are various tools available to collect and analyse data to create a city’s resilience profile with specific strengths and weaknesses, and a baseline for planning and measuring future progress.

7.6 Scenario planning and urban resilience testing

The responsible body should use physical simulations (resilience exercising) of planned scenarios to determine the preparedness and responsiveness of communities to urban disruptions and to test the impact to specific events such as earthquakes, terrorist incidents or floods.

The urban resilience lead supported by the strategy team should develop scenarios to stress-test current assumptions, the baseline model, future trends, and identify urban resilience strategies.

7.7 Identify and prioritize urban resilience needs

Urban resilience needs are the key output of the urban resilience assessment and provide a broad categorization for the development of urban resilience initiatives. Urban resilience needs are where the majority of risks to the urban system converge and concentrate, and where urban resilience objectives can be maximised.

The strategy team should:

- a) identify and arrange the urban resilience needs into broad categories based on the results of the system resilience assessment;
- b) verify and prioritize the urban resilience needs through analysis and assessment;

- c) conduct participative stakeholder engagement activities (as needed) with the local community, steering committee and with the advisory board to build consensus on priority urban resilience needs to be addressed through the urban resilience strategy.

See [6.3](#) for guidance on community engagement strategies.

8 Strategy development

8.1 General

The strategy team should consider the appropriate treatment for identified risks (see [8.2](#)) and develop an integrated urban resilience strategy that sets out a series of risk reduction and resilience capacity building initiatives (see [8.3.1](#)), which are prioritized according to their contribution to the urban societal objectives and other agreed criteria (see [8.4](#)).

8.2 Risk appetite and treatment

The responsible body and steering committee, with input from the advisory committee as appropriate, should provide guidance to the strategy team on acceptable levels of urban area risk to deliver the urban societal objectives (i.e. their risk appetite).

The strategy team should review the risk-based urban resilience assessment described in [7.5](#) and propose appropriate treatments for the identified risks and urban resilience gaps.

This may include the following options:

- a) avoiding the risk through threat or hazard mitigation;
- b) accepting the risk;
- c) reducing the risk through appropriate resilience capacity building initiatives;
- d) sharing or transferring the risk to another party, for example, an insurer.

This should be agreed with the responsible body and steering committee, and documented in the urban resilience strategy.

8.3 Development of urban resilience initiatives

8.3.1 General

The strategy team should develop a range of urban resilience initiatives that:

- a) are based on robust evidence, taking account of the urban resilience needs prioritized in [Clause 7](#) and the risk appetite of the urban area (see [8.2](#));
- b) resist both shocks and stresses and capitalize on emerging opportunities due to future change;
- c) reflect the urban area's own circumstance, addressing the areas of greatest need and greatest benefit, thus creating transformative improvements in urban resilience;
- d) integrate all aspects of the urban area, working across silos and sectors;
- e) consider the short, medium and long term;
- f) are clearly linked to stated outcomes with timelines and benefits (e.g. contributions to urban societal objectives) articulated;
- g) include a whole-life business case for each action, programme or major project which can be used as the basis for delivery;

- h) include plans for action implementation, action owners and timescales, and methods for monitoring effectiveness and progress of these actions;
- i) are adaptable to future change to avoid obsolescence;
- j) emphasize proactive risk reduction measures rather than reactive response and recovery.

The urban resilience lead should seek the best combination of novel urban resilience initiatives, and recognized practices adapted to the specific needs of the urban area, which are guided by the principles outlined in [Table 1](#). [Table 3](#) provides examples of urban resilience capacity building initiatives, which are aligned with these principles.

Table 3 — Examples of urban resilience capacity building initiatives

Principle	Examples of urban resilience capacity building initiatives
Integrated	— Identify and fund an urban resilience lead or equivalent — Establish a cross-sectoral committee/platform (e.g. a resilience forum) — Set up governance structures to share risk and opportunity across a wider area — Make financial arrangements to share risk (e.g. catastrophe insurance) — Invest in an integrated information management system
Inclusive	— Build community trust and cohesion — Set up community education and training programmes — Set up an urban area dashboard so that citizens can track changes in the urban area and check data sets — Provide a public notification system to warn, inform and empower citizens — Include public community spaces within projects — Consider who benefits from the urban resilience measures developed and ensure the benefit is equitable — Seek to target vulnerable groups with resilience measures as they tend to be disproportionately affected — Ensure the total value of resilience measures are captured, i.e. social, environmental, technical and economic — Empower ownership of resilience across all urban area stakeholders
Adaptive	— Develop ability to manoeuvre to avoid risk but also to capitalize on opportunities — Design flexibility into systems so that they can be adapted to future changes, for example changes in population, technology, climate change or use — Cross-training to broaden the workforce's skillset — Utilize the adaptation pathways approach to decision-making and planning — Leverage technologies to facilitate wider adoption of processes and support ease of change

Table 3 (continued)

Principle	Examples of urban resilience capacity building initiatives
Aware	— Develop policies to capture evidence, learning and innovation — Develop a forum that brings policy makers closer to those with the best evidence base (e.g. a science/policy interface) — Provide monitoring systems to identify changes and opportunities — Conduct trend analysis and scenario planning (e.g. monitoring and identifying cross-sector implications of change and innovation) — Provide monitoring systems to give warning of the potential for an adverse event (e.g. a flood, earthquake, landslide, wildfire). This will provide an opportunity to implement protective and preventative measures. — Develop real-time data collection to monitor disruptions, such as on transport systems — Install sensors on infrastructure to understand conditions and create alerts in cases of damage or disruption — Procedures for multi-agency debrief and learning
Prepared	Prevent — Legislation to control the storage or transit of dangerous chemicals in the urban area or the use of polluting and dangerous sources of energy — Planning policies that promote nature-based solutions as protections to high risks — Land use planning to avoid building in flood prone areas or to permit construction only of resilient buildings — Local policy to address risks outside of jurisdictional authorities such as land development restrictions near heavy rail corridors or restrictions for dangerous goods storage near developed or sensitive areas Protect — Action to protect or preserve the status quo, such as a barrier that permanently protects vulnerabilities from threats (e.g. flood defence scheme) — Flood storage schemes inside and outside the city urban area to ensure that flooding does not affect the city urban area — Fire engineering to prevent and reduce the spread of fire, protecting people and structures from fire — Land use planning to ensure that unacceptable risk is isolated from the city urban area (e.g. providing power from a nuclear plant away from the city urban area) — Harden systems to specific threats, such as a structure that has been enhanced to withstand specific extreme shock factors (e.g. wind, flooding, blast, wildfire or dust) Redundant — Add alternative components within systems, such as utilities in loops, so that service can be re-routed to ensure continuity in the case of disruption — Build redundancy in critical systems, such as power, data and water supply, through back-up (e.g. power generator) or replicated systems (e.g. data centres) — Build up financial reserves or lines of credit that can be rapidly accessed in times of crisis Fail-safe — Implement measures to ensure that any failure is proportionate and does not propagate within the system or instigate other shocks or stresses (e.g. identifying the failure modes of a structure and making sure that loss of one member does not cause disproportionate or progressive collapse)

Table 3 (continued)

Principle	Examples of urban resilience capacity building initiatives
	Respond — Develop coordinated evacuation plans at appropriate scales, including floor, building and zone plans. Depending on the scale, specific assembly, marshalling, transport and emergency shelter arrangements can be necessary. — Build the ability to provide a coordinated response and keep the public informed with pertinent information to reduce the impact of the event and to prevent cascading events — Provide response capacity, such as emergency services or other responders, to manage the direct impacts of an adverse event and accelerate recovery
Transform	— Develop contingency plans and recovery strategies to ensure continued operations of critical functions and rapid recovery following an interruption — Recognize that plans are only part of a planning cycle, which includes consultation, formulation, implementation, resourcing, testing, exercises, debriefs, learning and adaptation — Incorporate tools and planning into recovery strategies to ensure stakeholder engagement and coordination of recovery activities to provide maximum benefit, build back better and turn an emergency into an opportunity to bounce forward — Keep spare components to aid in rapid repair and recovery of critical systems — Develop policy measures to attract new employment as old industries decline, which can include changes to education policies or investment infrastructure to attract new investment — Develop community-based initiatives that build agency and ownership in the community (including vulnerable populations)

NOTE 1 ISO 22395 gives guidance for organizations in identifying, involving and communicating with and supporting individuals who are most vulnerable to natural and human hazards. It also includes guidance for continually improving the provision of support to vulnerable people.

NOTE 2 ISO 22301 specifies the structure and requirements for implementing and maintaining a business continuity management system (BCMS) that develops business continuity appropriate to the amount and type of impact an organization is willing or not willing to accept following a disruption.

NOTE 3 ISO 22325 provides guidelines for an organization in assessing its emergency management capabilities.

NOTE 4 ISO 22361 aids in the design and ongoing development of an organization's crisis management capability, setting out principles and practices needed by all organizations.

NOTE 5 ISO 22393 provides a framework for how to govern, coordinate and assess the impacts of major emergencies, disasters and crises on communities, and address these by planning transactional recovery activities and strategizing transformational renewal initiatives.

NOTE 6 ISO 22320 provides guidelines for incident management.

8.3.2 Adaptation pathways

The strategy team should apply the adaptation pathways approach for addressing the uncertainties in long-term risk management decision-making (such as related to economic growth and decline, population shifts, and the impacts of climate change).

This should enable the consideration of multiple possible futures and allow analysis/exploration of the robustness and flexibility of various urban resilience initiatives.

8.4 Prioritization of urban resilience initiatives

8.4.1 Benefits analysis

Strategies should seek multiple benefits and capture cascading benefits (positive effects of one system benefit on another). A benefits mapping exercise helps determine where benefits will be felt, how benefits will be delivered, why the system benefits from the strategy and who/which group(s)/sector(s) stand to benefit. If the mapped benefits disproportionately favour or discriminate against groups or sectors within the system, the strategy should be reviewed against the principles set out in this document. In some exceptional circumstances, urban resilience strategies can be required that actively favour a particular sector(s) or group(s) in order to address disproportionate vulnerabilities or risk exposure. In these cases, the benefits should be justified within the strategy.

The strategy team should:

- a) assess the benefits brought forward by the urban resilience strategy across the whole system, and for the whole life cycle of each project;
- b) construct a matrix of proposed strategies versus desired outcomes/performance criteria;
- c) align the outcomes/criteria with the shared vision and urban societal objectives;
- d) prioritize the importance of these outcomes with the steering committee and with stakeholder consultation.

NOTE By rating strategies against each of the outcome criteria, weighted and summed, a ranking can be established. A five-point scale often permits prioritization of outcomes that have multiple benefits.

8.4.2 Stakeholder engagement

The strategy team should engage with the steering committee and other key stakeholders including representatives from local and other levels of government, the private sector, and civil society (NGOs, academia, etc.) to present, discuss, further develop and prioritize the proposed initiatives.

NOTE See [6.3](#) for guidance on community engagement strategies and activities.

The strategy team should:

- a) prioritize initiatives against urban resilience needs and explain the extent to which the initiative contributes to the agreed urban societal objectives and aligns with the principles;
- b) provide a time frame within which initiatives should be delivered – short, medium or long term;
- c) identify whether these initiatives are achievable (feasible and implementable) within the context of the urban area, governance structures, implementation partners and funding;
- d) confirm that initiatives align with other local, regional and global initiatives such as the United Nations Sustainable Development Goals.^[1]

The advisory board should review and comment on these priorities. The urban resilience lead should allow a sufficient commenting period on the specified list of recommendations for all stakeholders, to express concerns or provide additional recommendations to be reviewed and considered within the strategy.

8.5 Insurance and risk transfer

Insurance is a contract, represented by a policy providing an individual or entity with financial protection or reimbursement against losses from an insurance company. Insurance policies hedge against the risk of financial losses resulting from damage to the insured or their property, or from liability for damage or injury caused to a third party.

The responsible body should collaborate with insurance companies to promote investment in urban resilience through:

- a) reducing premiums to encourage citizens, organizations and institutions to invest in improving levels of urban resilience;
- b) providing funding to upgrade properties resulting in fewer claims and potentially lower premiums;
- c) providing a multi-year policy tied to a property, which provides incentive to invest in urban resilience, and potentially lower premiums; and
- d) establishing a mutual profit-sharing pool for property insurance where members benefit from reductions to other's risks, making expenditure on increased resilience more attractive when premiums are lower than those generally available in the market.

9 Implementation

9.1 General

Project, programme and portfolio management provides for a cohesive and comprehensive strategic framework against which each initiative can be assessed, prioritized, funded and scheduled. The implementation team should employ methodologies to implement initiatives based on time, quality and resource priorities, risks and opportunities.

9.2 Portfolio and project management structure

The responsible body should, supported by the implementation team:

- a) implement the urban resilience strategy through projects and programmes of work coordinated across urban departments;
- b) confirm that each department understands the overarching urban resilience strategy to ensure that new projects are effectively integrating resilience wherever possible;
- c) establish a portfolio management office (PMO), or similar management arrangement to provide collaboration between departments and oversight of the delivery of the urban resilience projects and programmes of work;
- d) build flexibility into delivery models allowing for management in changing situations and response to risks.

NOTE ISO 21504 provides guidance on the principles of project, programme and portfolio management.

9.3 Programme and project delivery

9.3.1 Ownership

An implementation team should be assigned from the existing staff within the responsible body, or a team specifically set up to take ownership of delivering the urban resilience strategy.

The urban resilience lead should:

- a) ensure that urban resilience projects and programmes are assigned a member of the implementation team;
- b) ensure that resilience is embedded into existing projects across the urban area.

9.3.2 Development

The implementation team should:

- a) develop tactical delivery programme and project plans based on the initiatives outlined and prioritized in the urban resilience strategy;
- b) include project owners, outcomes, timescales, funding, budget, procurement and partners;
- c) consider small pilot projects and trials as a means to test and improve before a large-scale roll out of projects.

9.3.3 Schedule

Urban resilience projects should be mapped along a multi-year delivery timeline used to feed into the urban area's annual capital improvement planning so that funding is available to support implementation. The delivery timeline should identify owners within the urban area's various departments to ensure that stakeholders understand their role and responsibilities and the responsible body can hold them accountable for delivery.

The implementation team should:

- a) develop a clearly defined framework with key milestones and deliverable dates for managing the delivery of each project;
- b) include deadlines and deliverables aligned with the various phases of the project;
- c) identify key partners/stakeholders for each deadline and deliverable;
- d) incorporate the adaptation pathways approach for managing uncertainty to events such as climate change.

9.3.4 Budget

Financial resources for urban resilience capacity building should come from a central source within the responsible body to avoid the barrier of departmental budgets.

The responsible body with guidance from the urban resilience lead should:

- a) ensure that project budgets are appropriately allocated;
- b) require the implementation team to closely review project budgets so that all projects deliver clear value for money.

9.3.5 Partners

The identification and engagement of key partners in the development, design, and implementation of the urban resilience strategy is essential for ensuring the successful implementation of the plan. The implementation team should identify key partners in developing and delivering urban resilience projects, drawing on the data gathered and the exercise of stakeholder mapping.

Partners external to the responsible body are essential to the successful implementation of the strategy. Key delivery partners can include:

- a) private sector partners that are required for implementation of certain projects;
- b) procurement delivery partners that may provide funding, goods, or services in support of project delivery;
- c) facilitation partners that can assist with stakeholder engagement and ensure community buy-in for the projects;

- d) government, private sector, and non-government partners that can support the implementation of the projects;
- e) local communities – projects developed and led by the community are often the most effective.

NOTE See [6.3.3](#) for guidance on identification, mapping and analysis of stakeholders and identification of partners.

9.3.6 Procurement

Procurement methods will include competitive bidding and competitive proposals as well as on-call contracts and pre-qualified bidders. Pros and cons of each procurement method should be evaluated relative to the specifics of the project and the financing methods being used. Procurement processes for a project financed through a public-private partnership will differ from procurement processes used for a grant-funded project or a project funded directly from the urban area's capital budget.

The implementation team should:

- a) align the procurement strategy with the expected funding and financing mechanisms used for each project (see [9.4](#));
- b) consider different mechanisms for contracting with providers based on the specific details of project implementation;
- c) prioritize, as appropriate, the assignment of contracts to local contractors and suppliers to maximize the delivery of social and economic value to the urban area;
- d) consider the sustainability and resilience of the supply chain when procuring goods and services;

NOTE ISO 20400 provides guidance to organizations, independent of their activity or size, on integrating sustainability within procurement to ensure that the goods and materials used are made using sustainable processes.

9.4 Financing urban resilience

9.4.1 General

Financing should be an integral part of urban resilience. Urban resilience finance serves to create incentives for resilience and fund resilience investment, allocate risks and provide financial relief for post-disaster/stress. Financing can be at city, state, country or project level and involves raising funds and determining when and under which circumstances to repay, as appropriate. Financing can be used to shift available funds (net sources and use) across circumstances (i.e. before, during or after a disaster).

The responsible body should consider financial contingency planning for the urban area. The urban resilience lead, with input from the advisory committee as appropriate, should identify potential sources of financing for the urban resilience projects and programmes.

NOTE Examples of financial instruments, incentives and mitigation strategies are given in [Annex B](#).

9.4.2 Business case for investment

The urban resilience lead, with support from the implementation team should:

- a) understand who owns risk and reward;
- b) develop a strong business case to secure investment based on risk and return on investment that includes not only financial returns but also returns on well-being, economic opportunity, social cohesion, biodiversity, climate mitigation and other factors of urban resilience.

10 Continual improvement

10.1 Overview

The process of developing urban resilience involves ongoing and inclusive engagement, assessment, development, capacity building, empowerment and learning so that resilience becomes embedded within the culture of the urban area and forms the basis of strategic decisions.

The responsible body should:

- a) implement a process for continual improvement and active learning development to support long-term urban resilience and inform decision-making around planning and investment;
- b) ensure that the process of intentional evaluation of past performance embodies the “aware” principle of urban resilience (see [Table 1](#)) and accepts the inherent and ever-increasing uncertainty and change;
- c) include mechanisms for monitoring, evaluating and progress reporting to inform modifications to improve performance and support adaptation to changing circumstances.

NOTE ISO 22313 provides guidance on continual improvement.

10.2 Monitoring

10.2.1 General

Monitoring equipment such as sensors should be used to enhance situational awareness by informing on real-time issues within the system (e.g. traffic problems or operational issues) and to warn of impending risks (e.g. river flooding). Monitoring equipment can be deployed for infrastructure systems including energy, water, telecommunication, and transit networks, as well as for environmental systems such as air quality, seismic risk, and water levels.

10.2.2 Enhance situational awareness through real-time data collection

The responsible body should enhance their situational awareness through the use of real-time data and information-sharing appropriate for critical early warning and to inform preparatory planning and action. For example:

- a) Response (during an emergency) – to ensure the emergency response requirement is known immediately (what is appropriate and where it is required to protect the most vulnerable);
- b) Recovery (after an emergency) – to understand what has been damaged, prioritize activities and check on the effectiveness of any remediation;
- c) Communication (in real-time) – to assist with coordination, sharing, morale and building trust with the community.

10.2.3 Monitor progress of the urban resilience strategy

Different stakeholders may require data and information at different times, scales, and metrics. At the executive level, a dashboard can provide a summary of the vision and agreed objectives of the urban area, and performance against current priorities.

The responsible body should:

- a) monitor the progress and impact of urban resilience project implementation;
- b) use regular, timely, clear, transparent and inclusive monitoring methods undertaken by stakeholders across the urban area;
- c) focus on the quantification of progress toward the intended urban resilience objectives, and promote achievement of broad resilience benefits rather than the short-term outputs of individual projects;

- d) engage subject matter experts and other stakeholders in both identifying criteria for success that demonstrates resilience progress (i.e. identifying the metrics that matter to the local government, community, investors/funders, and other key stakeholders to evaluate effort invested and value achieved) as well as in participation in the data collection, analysis and review.

To maximize the value of data, this process can be integrated into a broader urban resilience information management system that supports policy and operational processes with a training and communications plan so that all key staff are aware of and educated on the use of the system.

10.2.4 Horizon scanning

The responsible body should:

- a) undertake horizon scanning through an inclusive process that identifies potential shocks, stresses, trends across the urban resilience system (including on vulnerable populations);
- b) if required, provide for a more extensive approach to horizon-scanning to identify and understand future drivers, such as climate change projections and how these will impact urban resilience;
- c) monitor emerging risks and trends through horizon scanning for future shocks and stresses to the urban area, as well as innovation in approaches, methods and techniques for improving urban resilience.

10.2.5 Reporting and auditing

Like many cross-cutting, urban-related topics, there is a potentially very broad group of stakeholders with whom to communicate, some of whom are part of a regular and prescribed reporting structure. Robust review and audit arrangements are recommended, integrated across statutory response organizations, the not-for-profit sector, commercial organizations and communities. Urban resilience data and knowledge come from multiple sources and can vary in nature and quality. Therefore, appropriate collection, management and analysis are key to providing assurance of completeness and to mitigate against decisions being skewed towards areas where the best data are available. This helps ensure a cross-city and cross-service perspective.

The responsible body should:

- a) ensure that audit and validation activities are appropriately resourced;
- b) provide the data collected when monitoring the resilience progress before the audit, and be openly available for collaboration and public scrutiny, where possible;
- c) carefully manage sensitive data on urban resilience (i.e. critical infrastructures, risk and vulnerability data, and security arrangements);
- d) ensure that stakeholders who receive formal reporting understand its purpose, expected follow-up actions and their responsibilities;
- e) use regular open reporting to maintain the tempo of implementation for resilience capacity building, with stakeholders being held accountable;
- f) use audits, post-exercise reports, and post-incident reports to collect information to facilitate preparation and learning, identify further actions and implement improvements.

10.3 Identifying further actions and implementing improvements

Following monitoring, reporting and review, the urban resilience lead should:

- a) identify any new actions or modifications to existing actions and assign these to the appropriate representative;
- b) update the strategy and implementation plans to reflect these changes and additions;

- c) provide for the regular review of agreed actions and modifications to confirm that they have been effectively implemented and to assess the impact of implementation.

10.4 Learn, innovate and transform

Learning should be developed through various activities, which may include a programme of simulations and operational exercises specifically focused on building preventative and predictive capacities. Peer involvement in such exercises can be a means of learning. Learning should be used to inform future projection models to allow effective scenario planning. Crises and disruptions force change on urban systems and make them more adaptable and open to new opportunities and transformation.

To enhance learning and innovation, the responsible body should:

- a) develop a culture of learning and innovation within the urban area, facilitating the transfer of knowledge and capability to businesses and across communities;
- b) enable people to identify potential issues and opportunities early, to be more nimble and agile, and to respond more competently;
- c) consider establishing partnerships and collaboration activities with other urban areas and regions;
- d) facilitate an open and honest debrief after every incident, to ensure lessons can be learned;
- e) look for opportunities to bounce forward, building additional resilience into urban systems;
- f) assess all initiatives delivered as part of the urban resilience strategy, with recommendations feeding back to leadership.

NOTE ISO 22393 provides a framework for how to govern, coordinate, and assess the impacts of major emergencies, disasters and crises on communities, and address these by planning transactional recovery activities and strategizing transformational renewal initiatives.

10.5 Re-measuring

The urban resilience lead and strategy team should periodically repeat the urban resilience assessment to determine how the learning and development of urban resilience capacity has progressed, comparing baseline levels to agreed targets.

10.6 Incentivizing continual urban resilience improvement

Public perception of risk is a complex area; people tend to focus on the most recent disaster rather than the one from which they are at most risk. There is also a tendency to forget the disaster very quickly, unless they are directly affected. Additionally, the majority of the public express a greater concern for problems which appear to possess an immediate effect on everyday life such as a pandemic than for longer-term problems that can affect future generations such as climate change or population growth.

To engage individuals and organizations in building and delivering urban resilience capabilities, the risk, value and benefits should be understood and communicated. Organizations should be motivated to invest in resilience through a multitude of routes including regulation, adoption of standards, and being able to measure and monitor the value of resilience and the value at risk.

The urban resilience lead should foster a resilience culture and mindset that delivers continual engagement, learning and improvement through activities such as:

- a) articulating the value of investing in urban resilience initiatives;
- b) educating citizens and stakeholders in risk management and urban resilience practice;
- c) empowering and facilitating communities to take ownership for their own resilience;
- d) understanding and co-ordinating interdependencies across sectors;